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The Key West Turtle Kraals Museum—But a Short Step Back in Time

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For well over 150 years the green turtle industry was to the economy of Key West as commercial whaling had been to New Bedford

In the early 1800s when people first started constructing turtle kraals* in the Florida Keys, Florida was not yet a U.S. territory, the Keys were not connected to the mainland, a few pirates still roamed the seas, and no one had even thought of giving hurricanes names. The Keys were essentially uninhabited and neither the pirates nor storms could find much to plunder. As a child I first visited the Key West turtle kraals in the 1950s and later returned in my college days in the early '60s. At the time they were still in the business of processing green turtles for meat and soup. The town's major industry was originally built on the local abundance of green turtles, but well before the time of my first visits Key West had become totally dependent on turtles imported from the coastal areas of Mexico and Central America. Local sponge fishing had also become less important in the Keys, and by the mid-1900s shrimp and later drugs dominated the Key West economy. While local restaurants still offered various dishes prepared from green turtles, by the mid-1900s the Keys were better known for sport fishing and key lime pie. Still at least one company remained that was canning green turtle soup and sending fresh turtle meet to northern markets (U.S. Fish and Wildlife Service, 1954). By the time of my later visits in the early '70s through the early '80s the kraals were becoming a tourist attraction. Adult green and other species of marine turtles were exhibited in the kraals, there was some information on the local history of the turtle industry, but a large percentage of the one remaining building had become mostly a gift shop for tourists. Yet, even then, Key West was not the tourist destination it is today, and the kraals were one of only a handful of attractions open to the public. By the '60s the Caribbean turtle populations had totally crashed and fishing boats were bringing in fewer and smaller turtles. In the mid-'70s the protection of green and other sea turtles provided by the Endangered Species Act finally closed down Key West's already fading soup and turtle meat canning industry.

Figure 1. A green sea turtle confined in one of the kraals. Photographed by the author in November 1971 when the cannery was in the process of closing its operation.

This winter I again visited Key West to find that what little remained of the once important economic component of the town's economy had been transformed into a museum. The original kraals and supporting structures had fallen into disrepair and time and tropical storms had taken their toll. The site of the kraals was renovated into the museum, a number of artifacts from the days of the green turtle industry were recovered from the area, and the revamped facility opened its doors to the public in 2009. This museum fills an important role in preserving the history of green turtle exploitation. Despite the existence of the canning industry well into the 20th century, the information currently available about the history of this important Key West industry is scattered and scant. Ernst and Lovich (2009), for example, devote 26 pages to the biology of *Chelonia mydas* without a single word about the extensive and historic Key West turtle operations.

The kraals at Key West started to appear in the early 1800s, perhaps earlier, as historical information is sketchy. The local economics of harvesting green turtles changed dramatically in the early 1800s. Florida became a territory of the United States in 1821 and in 1826 the U.S. Revenue Cutter *Marion* worked through the Keys removing 20–30 Bahamian turtling boats so that the lucrative green turtles were available solely for American enterprises. By 1828 the population of the Keys was 421 permanent residents; 100 of these were turtlers and fishermen. Many of these residents were "Conchs," Bahamian immigrants and their descendants, who formed the core of the key's original green turtle industry. Florida did not become a state until 1845. By 1885 at least half a dozen boats, each employing about five men, were dedicated to turtling.

John James Audubon after visiting Key West in 1832 noted "Each turtle has its 'crawl,' which is a square wooden building or pen, formed of logs, which are so far separated as to allow the tide to pass freely through, and stand erect in the mud. The turtles are placed in this enclosure, fed and kept there until sold." (Audubon, 1870, p. 265). The kraals were typically constructed on the leeward sides of the island or in sheltered areas where they received protection from waves and swells from the

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* "Kraal" is a South African term for a livestock enclosure, or stockade, and was likely derived from the Portuguese *curral* or the Spanish *corral*. The modern-day reference to "turtle crawls" is perhaps a folk etymology based on a combination of the word "kraal" and the actions of the captive turtles within the enclosures. The term "crawls" was later used for enclosures designed for the captive breeding of diamondback terrapins. In the early 1900s terrapins propagated by the U.S. Fish Commission at Solomon's Island, Maryland, and Beaufort, North Carolina, were housed in terrapin crawls.

Figure 2. **a)** The author at the Key West Turtle Kraals in December 1983. The cannery had closed down but the structure was used as a gift shop and marine turtles of various species were maintained in the kraals as a tourist attraction. (photograph by M. K. Clark). **b)** Eventually the Kraals closed down and the abandoned cannery building soon fell into disrepair.

open sea. The wave action not only over time destroyed the structure of exposed kraals, but caused harm to the turtles that were crowded into the individual pens. The structures were often built under existing docks in areas where the water was at least five feet deep and the posts, originally made from palmetto trunks, were later constructed with concrete (Figure 1). Trap-doors in the docks allowed access to the turtles.

Up through the mid- to late 1800s green turtles remained abundant in the Florida Keys. For the most part the turtles were collected on the beaches when the females came ashore to nest. During the full moons from May through July nesting females ascended the beaches by the hundreds to nest throughout the Keys. The turtles were flipped onto their backs and the eggs and turtles were later collected once the last turtle had been turned. An account written in 1887 states that this went on night after night on almost every key. Floating nets were also set at sea. The nets were placed in "sets" near known turtle resting sites, and the turtles were captured at night when they began to move about. Individual nets were 50 to 75 fathoms in length (300–450 feet) and extended down 5–7 fathoms into the water (30– 42 feet). Turtles were also obtained by "pegging." The pegs were hook-like spikes attached to a line and harpoon-like pole. The loosely attached peg lodged into the turtle and the creatures were pulled into the fishing boats. Pegging often injured the turtles and the technique was not used much after 1900.

The first Key West cannery for turtle soup started in 1857 allowing the product to be mass-marketed to the outside world. For reasons unknown, but certainly the gearing up of the Civil War played a part, the first canning plant went out of business and the J. J Harrison's Cannery failed. By 1880, another Key West factory was reported to turn out 200,000 cases of turtle soup a year. Ten vessels and 60 men were employed in gathering the turtles (Simmonds, 1883). In 1890 Armand Granday, a French chef, opened a new operation. Local fishermen were at first reluctant to sell their catch to an outsider, but by 1900 the cannery was processing 10–12 turtles a week. In 1908 Norberg Thompson purchased Granday's canning plant but retained the Granday name for the soup brand and used the Thompson name for the turtle meat (Figure 3). Thompson moved the cannery to the Key West Bight, a site adjacent to the existing kraals. His actual butchering and canning technique was kept secret, but it was known that about a dozen turtles a day were processed. The green fat of the turtles was made into soup, but the meat and eggs were also sold. The cannery remained in business until

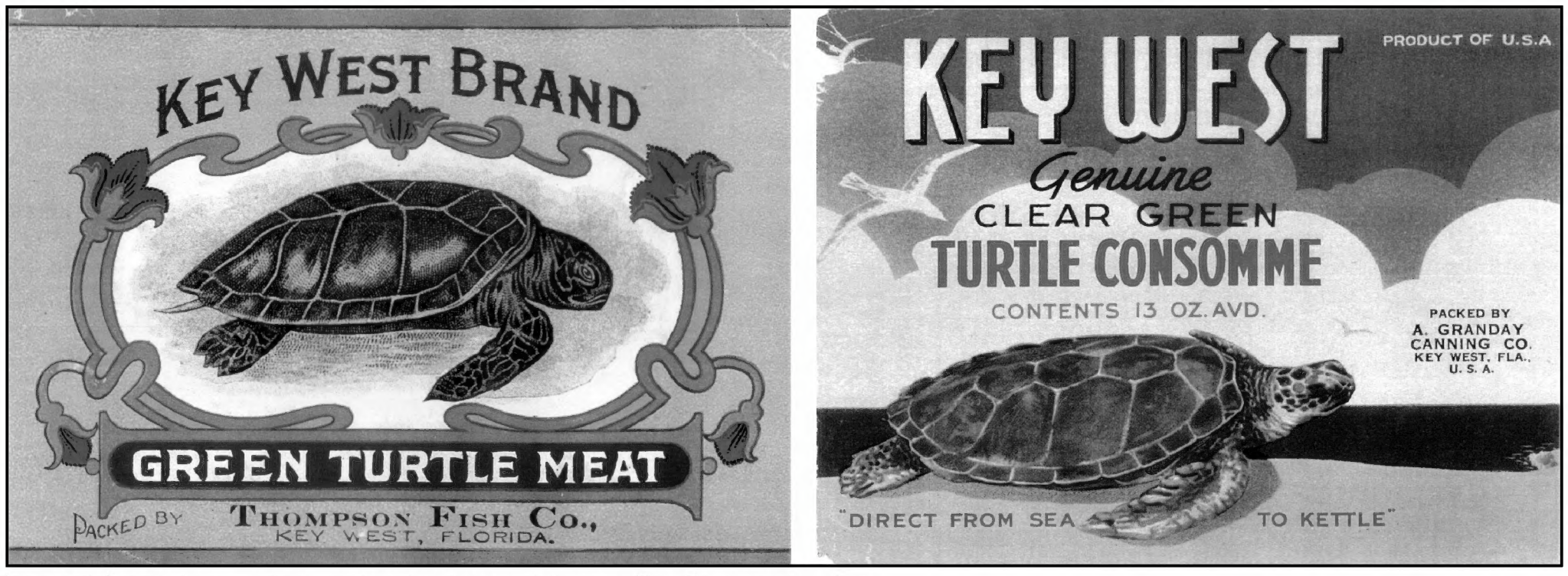
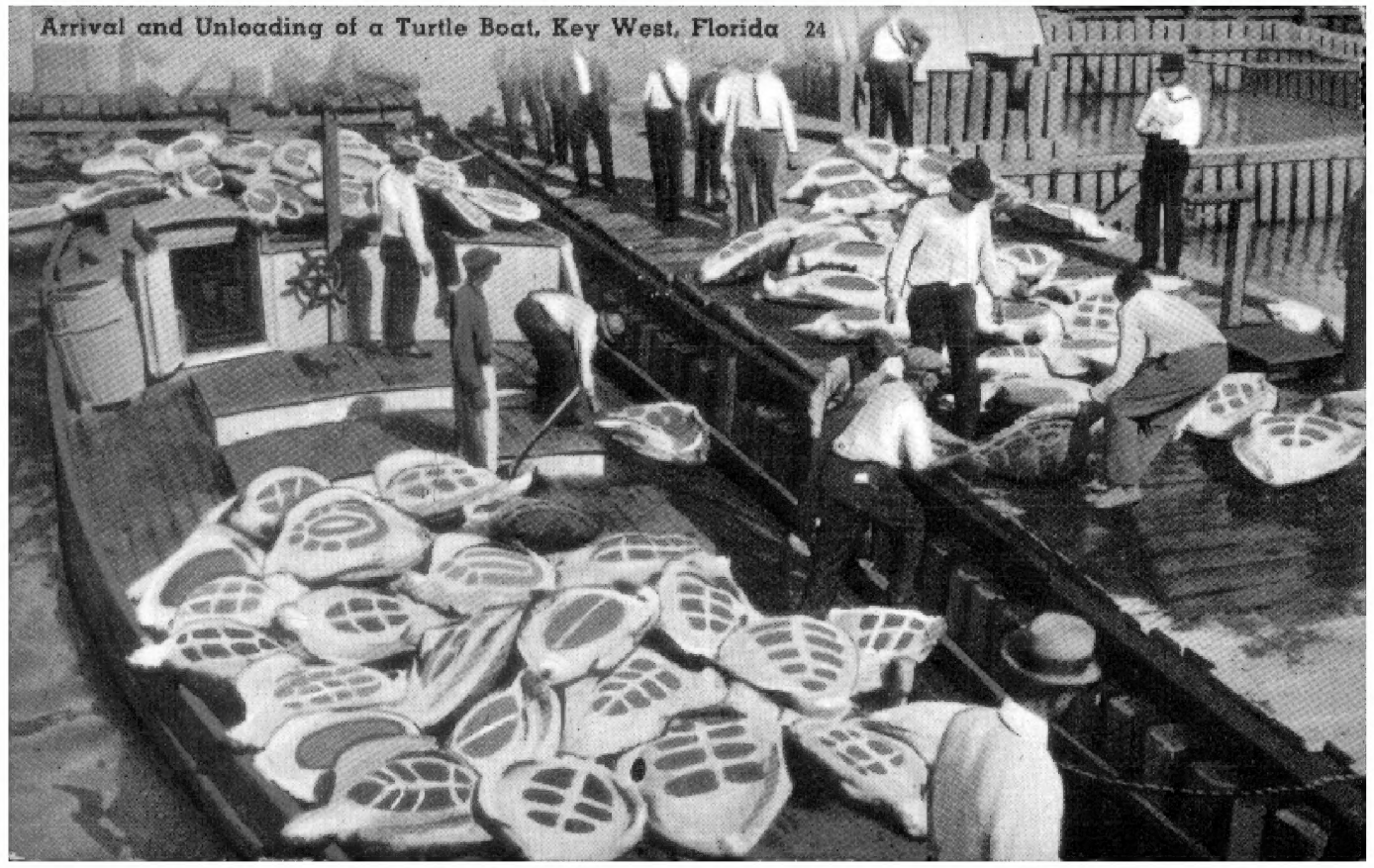


Figure 3. Labels from products produced and shipped from the Key West canning plant.



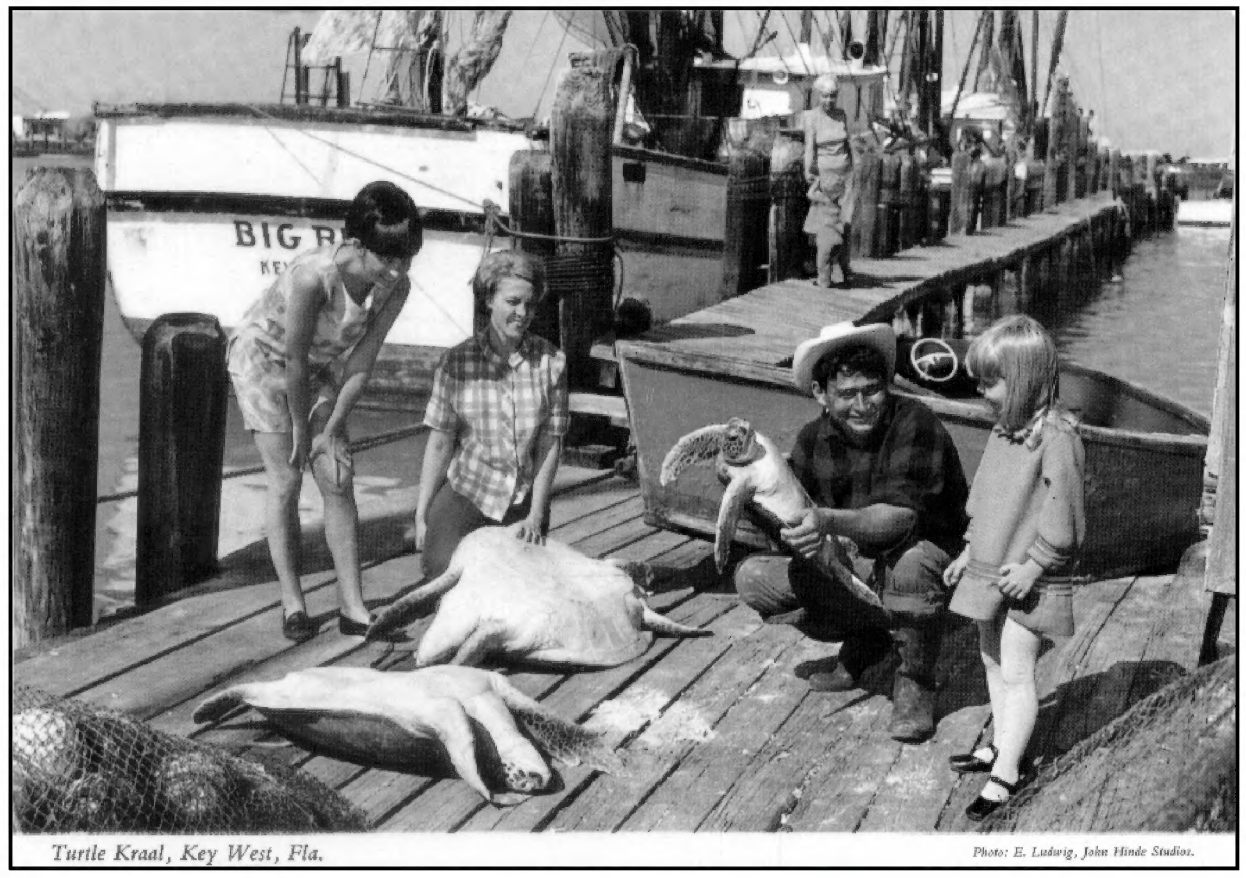


Figure 4. Postcards depicting scenes of Key West and the turtle kraals in the mid-1900s.

1957, and turtle butchering continued at the plant for another 15 years, spanning the time of my visits in the '50s and '60s and a visit in the early 1970s. The operation also became a tourist attraction. By the '60s a gift shop was added which offered, among other items, skulls of adult green turtles for $7.00 apiece.

In the U.S. the largest company in the business of making green turtle soup was Moore and Company Soups, Inc., of Newark, New Jersey. The company had been making turtle soup since 1883. The canned soup was sold under the Ancora brand. Originally the operation was located in New York as the turtles from Key West and other ports arrived loaded on banana boats, which carried turtle tanks on their decks. But following World War II, with the opening of better roads, the turtles could be easily trucked out of New York and the company moved to New Jersey because of its increasing demands for space. The Chinese population in New York was especially fond of green turtles, and a *New York Times* article (24 August 1939) quoted a person at the Fulton Street Fish Market as saying 80% of the turtles going through the market were consumed by Chinese. During World War II, beef was hard to come by and frozen green turtle steaks sold for 75 to 80 cents a pound and were unrationed.

In 1905 Henry Flagler started the Over-Sea Railway Key West Extension project. Completed in just seven years the 120-mile railroad connected Key West to Miami and provided transport for the canneries, allowing them to distribute their products to markets other than New York and other major seaports. Flagler financed the project with money he made from his capital venture in what was to become the Standard Oil Company. He envisioned the railroad as the port connection to shipping coming through the Panama Canal. The canal was to be completed in 1913 and he foresaw Key West as a coaling stop for ships coming from the West Coast. Newer ships and fuels soon made Key West obsolete as a coaling port, but rail transport did further open up the market for green turtle products. A Category 5 hurricane destroyed much of the railroad in 1935, but with the automobile having come of age in the early 20th century the bridges that had been constructed for the railway were converted into an overseas highway. With the advent of refrigerated trucks the market for green turtles was wide open, and Eisenhower's proposed interstate highway system would provide rapid transport to northern markets via I-95.

It is not possible to appreciate the context of the Key West green turtle industry without an understanding of the historical and economic importance of the turtles themselves. The first Englishman known to eat turtle meat in the New World was John Hawkins. He visited the Dry Tortugas 1563 and reported that the turtles taste "much like veal" (Markham, 1878). The turtle's fate was set, and over time the green turtle became recognized as the world's most economically important turtle (e.g., Pope, 1967); other authors have called it the world's most valuable reptile (e.g., Parsons, 1962). While green turtles were hunted by indigenous peoples before the dawn of history, they became an important food item of European gourmands by the close of the colonial period. Through the mid-1700s, though they were still an uncommon import, green turtles were being shipped to London from the West Indies and Ascension Island. In a popular magazine of the time it was noted that "what is common in the West Indies is a luxury here" (Anonymous, 1753). In the late 1700s, Robert Merry (1789) in reference to the use of the green fat of these sea turtles in soups, writes:

> These modes, howe'er, are alter'd, and of late
> Beef, but not Modesty, is out of date;
> For now, instead of rich Sir-loins, we see
> Green calipash, and yellow calipee.

Calipee and calipash were terms for the unossified tissues of the turtle's belly and backbone. The term calipee apparently was of Caribbean origin, and referred to the turtle's plastron, and calipash was used in reference for the carapace. The tissue is boiled to separate it from the shell and then dried in strips for shipment. An adult green turtle typically produced two-and-a-half to three pounds of this cartilaginous material. Like the diamondback terrapin that "never was intended for vulgar palates" (*NY Morning Telegraph*, 7 May 1912) green turtles were marketed in Europe and northern coastal U.S. cities for "confirmed epicures." By the mid-1700s live green turtles were being shipped to London. They were a prestigious food item and the soup was served at diplomatic dinners and ceremonial banquets.

While turtle was a favored fare of the upper class in the British Empire, this was not the case everywhere. In 1840 a soldier stationed at Ft. Pierce wrote "They are so cheep and common that the soldiers regard it as an imposition when compelled to eat green turtle steaks . . . " (Sherman, 1899; Carr and Ingle, 1959). The soldier was none other than William Tecumseh Sherman who, as a general, would later lead his infamous and devastating march through the South during the Civil War. Likewise the Spanish and Portuguese were not that taken by the green turtle as a food item, and some of the early European colonists believed that they were poisonous. The French suspected that the London connoisseurs liked turtle soup more for its rarity than its taste. To this day green turtles are not often exploited by descendants of the Spanish and Portuguese in the New World, while those of white English-speaking Protestant ancestry, and the descendants of their slaves still provide the principal market for turtles in the Caribbean region. The different cultural preferences for turtles, in turn, may have influenced the original pattern of English settlement in parts of Caribbean. It has been suggested that as much as any other factor green turtles were responsible for the colonization of the West Indies and even influenced the pattern of pirate activity in the region (Parsons, 1954; Woodbury, 1954).

In the Victorian period turtle soup made from green turtles was an established gourmet item in England, to the point that even imitation turtle soup had become a well-known commodity. For those who lacked the resources to order expensive turtle dishes substitute recipes became available. Artificial, or "mock," turtle soup could be made from a calf's head (Raffald, 1808). The Mock Turtle, one of Lewis Carroll's characters in his 1866 classic *Alice's Adventures in Wonderland* plays on this well-known dish. John Tenniel's illustrations of the Mock Turtle in Carroll's book not only show it to be part cow, but the animal parts depicted on the "turtle" were all ones discarded by meat processors—the tail, head and hooves (Figure 5). The taste for turtle soup in London and elsewhere had become well estab-

Figure 5. Lewis Carroll's play on mock turtle soup: Alice with the Mock Turtle and the Gryphon. Drawing by Sir John Tenniel from Carroll (1866).

lished by the time the Key West canneries went into operation and the stage was set for shipping to international markets.

The green turtle fishery apparently started in Bermuda, and by 1620 the Bermuda Assembly was already passing regulations to protect them (Carr, 1952) and as the turtles became scarcer the fishermen expanded their pursuit to the Bahamas and Ascension Island (Wilkinson, 1950). The turtles soon became scarce in the Bahamas as well, and the fishery turned to the Turks Islands, Cuba, the east coast of Florida and the Dry Tortugas (Carr, 1954). By the early 1900s the green turtle population in the Keys was also in sharp decline. The Key West cannery's output was only about 200 one-quart cans per day. The limited production was not caused by a lack of demand, but from the difficulty of obtaining turtles. Norberg Thompson, the owner of the processing operation noted, "At the time the industry was first started, Mr. Granday secured his turtles from about Key West, but they have become so scarce . . . turtles used in the manufacture of the soup are now caught in the Caribbean Sea, along the coast of Mexico, with some from Nicaragua." This was unusual as in other parts of the world at the time nearly all types of successful commercial fisheries were centered on species taken in local waters from boats working for the processing plants. In the final years the Key West cannery processed primarily turtles caught off Nicaragua by Cayman Island fishermen. The Cayman fishermen had harvested green turtles since the mid-1600s, but by the early 1800s their native stocks had also been reduced to near extinction. They turned their attention to fishing around the Miskito Cays of Nicaragua and found that marketing them through Key West was the most profitable.

Much of the actual green turtle fishing in the 1900s was conducted by Cayman Islands fishermen. Schooners would sail from the Cayman Islands to sites such as the grass beds of the Miskito Cays off the coast of Central America with supplies and small, double-ended dories used to set the nets. The net sets were placed near the coral outcrops where the turtles took shelter. Turtles surfacing to breathe were snared in the nets. In the morning the catch was carried in the dories to temporary kraals. When enough turtles were captured they were loaded onto the schooners and taken to Key West. The turtles were transported on their backs and constantly wetted down to keep them from overheating. A typical voyage lasted two months and brought back 500 to 600 green turtles.

By the end of the 1800s a number of authors were writing of their concerns regarding the future of the green turtle (True, 1884; Loennberg, 1894; Brice, 1897; Munroe, 1898) and the need for conservation actions for these turtles was recognized as early as 1620 by the Bermuda Assembly in what was undoubtedly the world's first conservation legislation. Yet, the commercial exploitation continued well into the 20th century, and these turtles are still legally hunted in the Bahamas and Turks and Caicos. Even though the public was aware of the plight of the green turtle, the demand for turtle soup and steak continued to remain high through the 1950s and early '60s. In 1962 the *Key West Citizen* reported that every 4 to 6 weeks a schooner from Grand Cayman arrived at the Kraals with about 400 green turtles, some weighing up to 500 pounds, and that about 25 turtles per day were butchered. The Sidewalk Café in Key West featured their specialty—Key West turtle burgers. By 1968 the turtle boats were coming less frequently and there was often a six-month lag between arrivals. Carr (1952) wrote of the declining but still extant Caribbean turtle industry and outlined the need for specific information that would be required if effective management of the species were to ever become a reality.

In the 1960s the U.S. and other governments began to address the issues. The Department of the Interior prepared a list of "possibly endangered species" in 1964. The list of 60 species included the green sea turtle. About the same time the Nicaraguan government refused to issue permits for netting turtles. In 1969 Nicaragua and Costa Rica asked for assistance from the United Nations to prepare "emergency" regulations to help stop the netting of green turtles in their waters. Thompson saw the writing on the wall, and in 1968 sold his Key West business to Sea Farm, Inc. As recently as 1970, a spokesman for the new owner boasted that the Kraals processed over 2,000 green turtles caught off the coast of Central America per year.

The Key West turtle kraals indirectly contributed to our early understanding of the long-range movements and homing ability of green turtles that first came to light in Archie Carr's (1956) *The Windward Road*. Carr interviewed a number of Cayman Island turtle fishermen who told of turtles they captured and shipped off to markets and later were recaptured at almost the same exact locations of their initial capture after escaping from holding pens. The most compelling evidence was a of 300-pound male green turtle that was recaptured 8 months later under the same coral outcropping on the Nicaraguan Bank. The turtle had been sold to Norberg Thompson, who operated the Turtle Kraals at Key West. Carr was able to match the incident

with a specific October hurricane that destroyed the kraals allowing many turtles to escape. The Cayman fishermen branded their turtles prior to sale. That along with peculiar bite marks on the flippers, allowed the fisherman to unquestionably identify this particular turtle. He later bragged to Carr that he had sold the same turtle twice to Thompson. This turtle traveled 800 miles in straight-line distance from Key West to its place of capture, and based on the placement of Cuba and major oceanic currents, the actual distance traveled would have been much greater. Through such anecdotal information Carr was able to begin to understand the homing and migration abilities of green sea turtles and suggest meaningful conservation programs for the Caribbean stocks.

In 1971 an organization calling itself "Conservation-70s" formed, and as a proponent of environmental concerns addressed the problems facing sea turtles. They recommended that green turtles with carapace lengths under 41 inches should be protected. In March of that year Florida Governor Ruben Askew signed into law an emergency order enforcing this size limit on any green turtle within the state's jurisdiction. The very day this order was signed the schooner *Adams* arrived at Key West with a load of 135 turtles, only five of which were of legal size. The combination of new regulations and the reduced size of the Caribbean population resulted in the closure of the entire operation (*Miami Herald*, 29 March 1972; *Key West Citizen*, 26 March 1972). Within two years the Endangered Species Act of 1973 listed green turtles as "threatened" and once the actual stock assessments were better understood the species was re-listed as "endangered" in 1978.

By the mid-'70s Key West was in a state of economic flux, while the actual import of turtles was in decline, the fishing boats coming in from Central America and the West Indies continued to make a livelihood. The Caribbean conduits to Key West brought quick cash. The marijuana and cocaine business, as one old Conch observed, was "like shrimping but easier and a lot better paying." This was a major business that for the most part was ignored for over a decade by the enforcement agencies in the outside world. It all started to unravel 1984 when an F.B.I. agent declared the Key West police department to be "an ongoing criminal enterprise" aiding and abetting a 16-million-dollar smuggling operation. The police chief and 13 others were indicted on 29 June 1984. (Navero, 2011). The populace of Key West has always remained a little on the outside the norms of society, perhaps this is due to its isolation from the mainland, but with the major drug smuggling operations closed down, there was even less of an incentive for fishing boats to venture into international waters.

With the close of the green turtle industry the canneries and kraals fell into disrepair and time and seasonal storms took their toll (Figure 2b). After several decades of dormant interest the site of the abandoned operation was transformed into a museum that explains the key role of the green turtle in the history and culture of the Key West. The waterfront site was excavated like an archeological dig and a number of the artifacts on display were ones recovered from the former kraals. The Turtle Kraals Museum opened its doors to the public in 2009. The remnants of only two kraals remain; a few of the original cement posts placed in the late 1920s by Thompson Enterprises can be seen from the docks at the museum.

Today gill nets, shrimp trawlers, boat strikes, loss of the turtles' sea grass foraging sites, oil spills, and beach development contribute to the continued loss of green turtles. The mats of pelagic *Sargassum* that the hatchlings take refuge in during their early months are also declining. Stoner (1983) provides evidence for major declines in the biomass of *Sargassum* in the North Atlantic, Caribbean Sea, and Gulf of Mexico. Between the 1930s and 1980s, there was an overall decline in *Sargassum* biomass attributable to anthropogenic pollutants. Since the 80s there have been a number of attempts to harvest *Sargassum* from the Gulf Stream for use in commercial fertilizer. Increasing numbers of turtles are now affected by fibropapillomatosis, large external tumors that are suspected to be caused by water pollution. There are sea turtle hospitals scattered throughout the world that deal with sick and injured marine turtles, one of them is in the Florida Keys. Turtles come in with every thing from injuries from fishing gear and boat strikes to fibropapilloma tumors. Many with missing appendages, buoyancy problems, and tumors can never be released and will spend their remaining time as captives. While the European and U.S. markets no longer drain the Caribbean stocks, green turtles and their eggs continue to be eaten in a number of West Indian countries and the migratory nature of green turtles makes them vulnerable to man's activities while protection and enforcement are sometimes minimal and often nonexistent.

The Key West waterfront is now largely dominated by bars, restaurants, and shops displaying local arts and crafts. One of the larger restaurants—within sight of the museum—is the Turtle Kraals Restaurant and Bar (Figure 6). The end of Margaret Street is a thriving tourist hub and the museum is easily missed, as the small inconspicuous building is lost among the visual clutter and neon glow. Today there are many tourist attractions at Key West—a public aquarium, a butterfly conservatory, several shipwreck and treasure museums, historic buildings to visit, and walking, bus, train and boat sightseeing tours. Sadly, the Turtle Kraals Museum, despite the historic and former economic importance of the industry to the city is not only easily overlooked, it does not even appear on the flyers and tourist attraction guides provided in every restaurant and hotel on the island. If I had not been looking for it, I would not have

Figure 6. Souvenir postcard from the Turtle Kraals Restaurant and Bar (2012).

known it was there. I even asked staff members in several restaurants that were actually in sight of the museum, and one of which was named after the kraals. No one had heard of the museum. One is more likely to come across knowledge of the kraals from looking through antique postcards in the local gift shops than learning of its existence through conventional means. A quick Google search for the kraals leads one through a maze of local businesses that have taken advantage of the name, but not the museum facility itself.

While it is unfair to place our modern-day conservation ethics as they relate to marine turtles on the economic enterprises of our ancestors, with all of today's concerns and the effort required to even partly restore sea turtle populations it is difficult to justify the past exploitation of these creatures and its extension into the present period. Likewise, in the not too distant future people will look back at today's commercial exploitation of reptiles and amphibians for the pet trade with disgust and wonder as why it took so long to control such a vast and unregulated, non-sustainable, international market. As in marine turtle conservation, the money made by a few will be overshadowed by the long-term cost of species restoration efforts. One does not need to read between the lines of text in the exhibit copy at the Turtle Kraals Museum, or study various books on marine turtles, to appreciate the pattern. While the annual number of adult and subadult green turtles coming through the Key West turtle kraals in its heyday seems phenomenal, it pales in comparison to what is currently transpiring with the food market and pet turtle and other reptile trades. The Fish and Wildlife Service reported that 1,594,451 reptiles were imported into the United States in 2003 and the numbers appear to be increasing (U.S. Fish and Wildlife Service, 2006). While many of these imports represent turtles, the exact number of turtles is not clear. Still the number of turtles exported and imported just from the United States is impressive. Salzberg (1995) estimated that in 1994 the wholesale value of turtles imported and exported from the country amounted to 22 million dollars. Lee and Smith (2010) noted up to 20,000–30,000 Russian tortoises being imported into the US annually and a global market of wild caught tortoises that may be as high as 200,000 exported each year. Solis (2009) reported on thousands of reptiles seized from a single animal dealer in Texas. It is well documented that variations in state and national regulations allow for laundering of turtles through places where laws and lack of enforcement enable the continuing networking of commercial exploitation. The fact that this level of use of turtles is unsustainable is without question, but it appears that we have learned little from well-documented effects of the commercial harvest of green turtles.

Regulatory agencies that continue to refer to our native wildlife as "natural resources" need to begin to rethink their terminology and to appreciate and protect national and international "resources" as much as they do local ones. The Turtle Kraals Museum in Key West provides an historical reminder of an unsustainable former international industry and its role in the devastation of an important species, one where full protection still awaits carefully thought out regulations and firm enforcement. Likewise it serves as a forecast of the long-term harms the commercialization of other reptiles captured from the wild present, and the time and cost that will incur in planned recovery efforts. Like most museums this one is a place to learn of our past, but perhaps more importantly it is also a place where one can reflect and perhaps think ahead.

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Notes on Reproduction of Desert Horned Lizards, *Phrynosoma platyrhinos* (Squamata: Phrynosomatidae) from Southern California

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Abstract

A histological examination of gonadal material from desert horned lizards, *Phrynosoma platyrhinos*, from California was conducted. Females were reproductively active from March into August. Mean clutch size (n = 22) = 6.9 ± 1.8 SD, range = 4–11. The relationship between clutch size and female body size was not significant. There was no evidence females produce multiple clutches. One female from 4 December had commenced yolk deposition, indicating this process may begin in late autumn. The smallest reproductively active female measured 62 mm SVL. Reproductively active males (spermiogenesis in progress) occurred from March to August. The smallest reproductively active male measured 63 mm SVL.

Desert horned lizards, *Phrynosoma platyrhinos* Girard, 1852, range from southwestern Idaho and southeastern Oregon, south to northeastern Baja California and northwestern Sonora, Mexico, where they inhabit arid lands from below sea level to around 1980 m (Stebbins, 2003). The most complete accounts of reproduction in *P. platyrhinos* are in Howard (1974) and Pianka and Parker (1975). Anecdotal information on reproduction of *P. platyrhinos* is in Shaw (1952), Stebbins, (1954, 2003), Tanner and Krogh (1973), Vitt (1977), Behler and King (1979), Lemm (2006), Brennan and Holycross (2009), Brown (2009). The purpose of this note is to provide additional information on the reproductive biology of *P. platyrhinos* based on a histological examination of gonadal material from museum specimens. Utilization of museum specimens for gathering reproductive data has become increasingly important due to the difficulty in justifying monthly collections of lizard samples.

Methods

A sample of 141 *P. platyrhinos* consisting of 70 adult males, (mean snout–vent length, SVL = 75.2 mm ± 6.5 SD, range = 63–93 mm), 56 adult females, (mean SVL = 78.1 mm ± 6.4 SD, range = 62–93 mm), 13 juveniles, (mean SVL = 29.7 mm ± 3.6 SD, range = 24–34 mm) and two recently born juveniles (SVL = 35, 36 mm) was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA. *Phrynosoma platyrhinos* were collected 1914-1989. Specimens examined are listed in the appendix by California county.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin and sections were cut at 5 μm, and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited in LACM. Enlarged ovarian follicles (> 4 mm length) or oviductal eggs were counted. An unpaired *t*-test was used to test for differences between male and female SVLs using Instat 3 (Graphpad, San Diego, CA).

Monthly stages in the testicular cycle are in Table 1. Four stages of the testicular cycle were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) early recrudescence, a proliferation of germ cells for the next period of spermiogenesis is evident as primary spermatocytes are the predominant cell; (3) late recrudescence, the spermatogenic cycle has progressed and secondary spermatocytes and occasional spermatids are present, in addition to spermatogonia and primary spermatocytes; (4) spermiogenesis, lumina of the seminiferous tubules are lined by

Table 1. Monthly stages in the testicular cycle of 70 *Phrynosoma platyrhinos* males from southern California.

Month	*n*	Regressed	Early Recrudescence	Late Recrudescence	Spermiogenesis
March	5	0	0	2	3
April	25	0	1	0	24
May	25	2	1	0	22
June	11	0	0	0	11
July	2	0	0	0	2
August	2	1	0	0	1

Table 2. Monthly stages in the ovarian cycle of 56 *Phrynosoma platyrhinos* females from southern California.

Month	*n*	Quiescent	Early yolk deposition	Enlarged Follicles > 4 mm	Oviductal eggs	Corpora lutea
March	1	0	0	1	0	0
April	16	4	7	5	0	0
May	27	5	6	9	4	3
June	4	2	0	1	1	0
July	3	2	0	0	0	1
August	2	1	0	1	0	0
September	2	2	0	0	0	0
December	1	0	1	0	0	0

sperm or clusters of metamorphosing spermatids. The smallest reproductively active males (spermiogenesis in progress) measured 63 mm SVL and were collected in April (LACM 101710, 101718, 149689).

The mean body size (SVL) of my female sample was significantly larger than the mean of my male sample (unpaired *t*-test, $t = 2.6$, $df = 124$, $P = 0.012$). Monthly stages in the ovarian cycle are in Table 2. Five stages were present: (1) quiescent, no yolk deposition in progress: (2) early yolk deposition; (3) enlarged ovarian follicles (> 4 mm); (4) oviductal eggs; (5) corpora lutea from a previous clutch. Females were reproductively active from March into August. Mean clutch size for 22 females was 6.9 ± 1.8 SD, range = 4-11. Linear regression analysis indicated the relationship between clutch size and female size (SVL) was not significant ($r = -0.138$, $P = 0.540$). One female *P. platyrhinos* (LACM 22209) collected 4 December exhibited early yolk deposition (Table 2) and suggests reproductive activity commenced during late autumn. There was no evidence in the form of oviductal eggs and concomitant yolk deposition or corpora lutea and concomitant yolk deposition, in the same female, indicating *P. platyrhinos* females produce multiple clutches in the same reproductive season. The smallest reproductively active female (early yolk deposition) measured 62 mm SVL and was collected in April (LACM 101711). The smallest *P. platyrhinos* examined measured 35 mm SVL (LACM 70221) and 36 mm SVL (LACM 70225) and were collected 23 July and 8 August respectively in San Bernardino County.

Discussion

Despite reports of production of two clutches by *P. platyrhinos* (Howard, 1974; Stebbins, 2003; Brennan and Holycross, 2009), I found no evidence indicating this to occur, even though Fitch (1985) claimed two clutches were normal in the southern part of the *P. platyrhinos* range. Vitt (1977) also found no evidence that *P. platyrhinos* females produced two clutches. The lack of positive correlation between female body size and clutch size might be due to my samples being collected from different years and localities although Pianka and Parker (1975) reported the correlation between clutch size and body size was weak for this species. My finding of one female from December that had commenced yolk deposition suggests this process begins in late autumn in *P. platyrhinos*. Howard (1974) postulated it must commence by February. My finding of reproductively mature *P. platyrhinos* males of 63 mm SVL is smaller than the 66 mm size for male maturity in this species from southwestern Arizona and northeastern Sonora, Mexico (Howard, 1974). It is also smaller than the smallest mature male *P. platyrhinos* (SVL = 68 mm) from southern Utah (Pianka and Parker, 1975). My smallest mature *P. platyrhinos* female (62 mm SVL) was also smaller than that of Howard (1974) which measured 66 mm SVL and the 70 mm SVL reported by Pianka and Parker (1975). Brown (2009) reported hatchlings of *P. platyrhinos* approximated 25 to 30 mm SVL. Thus, it would appear that my 35, 36 mm SVL juveniles had been active for some time. The clutch size of 6.9, range = 4-11 reported herein, is close to that reported for *P. platyrhinos* in southern Nevada, mean = 6.7 (range 3–9) by Tanner and Krogh (1973).

In conclusion, I found no evidence that *P. platyrhinos* produces multiple clutches in the southern portion of its range. The correlation between female body size and clutch size was not significant and appears to support Pianka and Parker (1975) who indicated this relationship was weak. The minimum sizes for male and female *P. platyrhinos* reproduction reported herein are smaller than those in other studies on this species. My finding of one female from early December that had commenced yolk deposition suggests females begin reproductive activity in late autumn.

Acknowledgment

I thank C. Thacker (LACM) for permission to examine *P. platyrhinos*.

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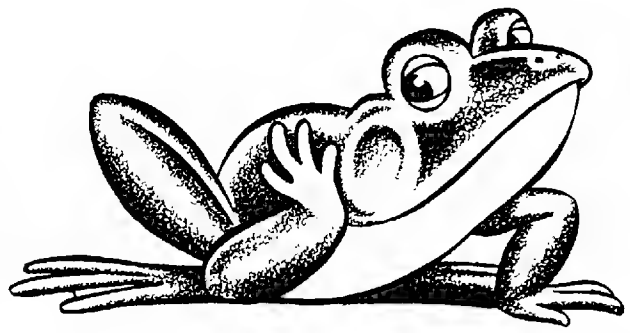
Appendix

Specimens of *Phrynosoma platyrhinos* from California (by county) examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM).

California: Imperial County: 4378, 4379, 8870, 26983, 35879, 101602, 126155, 137912, 145546; **Los Angeles County**: LACM 19796, 19797, 19799, 19800, 19803, 19804, 19828, 101622, 115570; **Riverside County**; 4388, 8866, 19808, 28782, 52771, 52773-52777, 52779-52781, 101603, 101625-101628, 101630-101633, 101635, 101637, 101639, 101640, 101641, 101644, 101647, 101648, 101650-101654, 101660-101662, 101668, 101673, 101674, 101680, 101681, 101688, 101691, 101695, 101696, 101700, 101703, 101705, 101708, 149680, 149689, 22209; **San Bernardino County**: LACM 19783, 19790, 19793, 19794, 21900, 36598, 52767, 63989-63991, 67732, 70213, 70214-70219, 70221, 70223, 70225, 74196, 19792, 101629, 101642, 101656-101658, 101667, 101670, 101679, 101687, 101706, 101709-101711, 101715, 101717, 101718, 101722, 101727, 101728, 101730, 101732, 101734, 101736, 101737, 101741, 101744, 101746-101748, 101750, 101751, 101753, 101755-101758, 115571, 115576, 122428, 122429, 123349, 125980, 149687; **San Diego County**: LACM 19797, 101477, 101480.

The Tympanum



It has been a pleasure to read in your past bulletins the excellent articles and book reviews by David and Tracy Barker discussing the controversies brought about by Burmese pythons in the Florida Everglades. The Barkers provide your readers detailed factual analysis of the ways some individuals utilize inaccurate information to support questionable conclusions that benefit those individuals in some manner.

As the Barkers so accurately warned, this faulty "science" has now resulted in federal rulings that are unfair to reptile owners and do not effectively solve the "python problem."

The use of questionable and self-serving information as documented in detail by the Barkers should be an eye-opening warning lesson to your readers.

Thank you again for printing the timely and valuable articles about this subject by David and Tracy Barker. **Paul Breese, PO Box 1049, Kapaau HI 96755.**

Unofficial Minutes of the CHS Board Meeting, June 15, 2012

The meeting was called to order at 7:45 P.M. at the Schaumburg Public Library. Board members Mike Dloogatch, Jim Foster, Jason Hood, Nancy Kloskowski and Jenny Vollman were present. This did not constitute a quorum.

Officers' Reports

Recording Secretary: The minutes of the May 18, 2012, board meeting were read.

Treasurer: The financial reports for May were discussed.

Membership Secretary: The current count stands at 510.

Sergeant-at-arms: Jim Foster reported that attendance at the May general meeting was 48

Committee Reports

Shows:
• Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
• Rockin' for the Reptiles, Midwest Museum of Natural History, Sycamore, June 30. Dick is looking for volunteers.
• Museum of Science and Industry Member's Night, July 25. Jenny Vollman will coordinate this event.
• SEWERfest, August 5, 10–3. They donate a table to the CHS.

ReptileFest 2013: The dates have been confirmed—April 13-14, 2013. This will be the 20th anniversary!

Old Business

Junior Herper Club: Some questions need to be looked at regarding the Junior Herpers. What are our goals for this club? What kind of budget should be allotted? What steps should be taken in starting this group? Possible goals or mission statement: proper husbandry, conservation, education. These questions need to be answered before starting the group. Adults who will be leading or helping with meetings or events need to be trained. Meetings could possibly be held at the Notebaert Nature Museum on the 1st Sunday of the month.

National Herpetological Society: Jason Hood has been involved and reports that the organization is starting to come together.

Conservation donations: Dupage County Forest Preserve District needs funding for Blanding's turtle conservation. The massasauga workers at Carlyle Lake need equipment for housing and care of fungus-infected snakes. Jason will look at possible donations of equipment before discussion of dollar amounts.

Bulletin printing: Mike has been looking into reducing our printing costs. He received a lower quote from another printer. Our current printer can match this price, with no loss of quality.

New Business

Snapperfest: Rob Carmichael has brought Snapperfest in Ohio county, Indiana, to our attention. He would like to explore possible action against this event. Many snapping turtles are removed from the wild and treated very badly. If an appropriate action can be decided on, the CHS would likely support it.

Round Table

Mike Dloogatch mentioned that the CHS has received a review copy of a new book on the amphibians and reptiles of Michigan by Alan Holman – it looks like a good book.

Dick Buchholz went herping in Kentucky and learned that a "cowsucker" is an eastern milksnake.

Jason Hood took visiting scholar Gunther Köhler herping in Wisconsin.

The meeting was adjourned at 9:00 P.M.

Respectfully submitted by Jenny Vollman

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

RED-BELLIED SNAKES IN ILLINOIS

L. E. Brown and C. A. Phillips [2012, Illinois Natural History Survey Bulletin 39(5):297-322] report that the examination of 387 preserved red-bellied snakes, *Storeria occipitomaculata,* from 18 museums and collections, literature records, and unpublished records have revealed distributional records throughout much of Illinois, in contrast to earlier studies which found a more limited distribution. Seventy-one records of habitat types from museum records, field notes, and literature indicated that the species occupies woodlands but is not primarily forest adapted. It also inhabits prairie and prairielike habitats in Illinois. The common occurrence of this species in this type of habitat has not heretofore been reported elsewhere in the range of the snake. These findings do not support an older zoogeographic theory that assumed the snake was nonadapted for prairie and thus excluded from the Prairie Peninsula. The authors propose that the species was able to occupy the area near the ice rim of the Wisconsin Episode glaciation, and followed the glaciation as it retreated because of the snake's cold tolerance, ability to inhabit northern prairies and coniferous forests, vivipary which allows thermoregulation by gravid females, and the relatively temperate climate along the glacial rim. Within recent times, it seems likely that the snake was extirpated throughout much of the former prairie by destructive changes associated with agriculture.

DIET OF THE RED DIAMOND RATTLESNAKE

E. A. Dugan and W. K. Hayes [2012, Herpetologica 68(2):203-217] describe the diet of the red diamond rattlesnake (*Crotalus ruber*) using data collected from museum specimens, live specimens from a field study, road kills, opportunistic behavioral observations, and existing literature. Dietary samples were collected from across the species' range, including Southern California (USA) and Baja Norte and Baja Sur (Mexico). Examination of 272 individuals resulted in 227 prey items recorded from 219 snakes. The diet of *C. ruber* consisted largely of mammals (91.6%), but also included lizards (7.5%) and birds (0.9%). No ontogenetic shift in prey type was evident, with mammals consumed by all snake size classes. However, adults fed on larger prey than juveniles. Sexual dimorphism existed in snake length, with adult males averaging longer than adult females. Juvenile males consumed larger prey than females, but no sexual differences in prey mass existed for adults when controlling for snake body length. Snakes from coastal populations averaged longer in body length than snakes from desert populations. Coastal snakes consumed a higher proportion of rodents, and prey of larger body mass when controlling for snake length, than snakes from desert populations. The presence of prey was independent of snake collection month, suggesting year-round feeding, as supported by observations of occasional winter feeding by snakes in California. Although *C. ruber* may scavenge food opportunistically, behavioral observations suggest that it relies heavily on ambushing mammal prey.

RELEASE OF CAPTIVE-REARED HELLBENDERS

C. M. Bodinof et al. [2012, Herpetologica 68(2):160-173] monitored movements of 36 captive-reared Ozark hellbenders (*Cryptobranchus alleganiensis bishopi*) released to augment wild populations at two sites on the North Fork of the White River (Missouri, USA). Radiotelemetry was used to collect 3610 hellbender locations from May 2008 to August 2009. The authors quantified movements at multiple spatio-temporal scales and made comparisons between two seasons of monitoring (1 = release–December 2008; 2 = January 2009–August 2009). At the finest (daily) scale, most hellbenders (90%–94% per season) were highly sedentary (≥50% of observations indicated no movement). Typical distances between daily locations when hellbenders moved were <5 m in Season 1 (median = 3.08 m, n = 331; range = 0.19–903.00) and <2 m in Season 2 (median = 1.80 m; n = 161; range = 0.21–34.00). During the study hellbenders rarely (35 of 492 movements) traveled >20 m between daily locations, and virtually all (34 of 35) such movements occurred in Season 1. At a broader scale, home ranges of hellbenders varied widely in Season 1 (range = 0.66–986.92 m^2, n = 26), but in Season 2 averaged only 31.33 m^2 (± 11.81 SE, n = 8) and 11.08 m^2 (± 3.25 SE, n = 7) at respective sites. Among hellbenders monitored long enough to exhibit settlement (estimation of a home range) 69% (18 of 26) dispersed ≤50 m from the point of release. The authors only noted mortality associated with dispersals >50 m at one site, when it coincided with abandonment of core habitat that was one-third as large as at the other site. At the broadest scale, 68% and 86% of hellbenders settled in core habitat of respective release sites, and most had settled within 21 d postrelease (range = 0–49 d). Collectively, hellbender movements indicated a short period of exploration followed by more permanent settlement and high site fidelity typical of wild conspecifics. Captive-reared juvenile hellbenders may be well suited for translocation; however, the quality of habitat at fine scale (10–30 m^2) and the extent of suitable habitat within release sites are important considerations.

DIETS OF NEOTROPICAL GOO-EATING SNAKES

J. M. Ray et al. [2012, Copeia 2012(2):197-202] describe the diet composition of six species of dipsadines (*Sibon longifrenis*, *S. argus*, *S. annulatus*, *S. nebulatus*, *Dipsas nicholsi*, *Dipsas* sp.) from two montane forest sites in central Panama. Between 2005 and 2007 we captured 473 individual snakes, of which 305 contained no prey and two contained gut contents. Of the 166 fecal samples collected, 41 had no identifiable prey and 125 contained identifiable prey. We analyzed fecal samples and found that dipsadines at our study sites feed on mollusks, annelids, and amphibian eggs. None of the six species examined feed exclusively on mollusks, although most do feed on a variety of soft-bodied prey. *Dipsas* feeds extensively on earthworms, *S. annulatus* feeds on mollusks and earthworms, and *S. longifrenis* and *S. argus* feed heavily on amphibian eggs when available.

TADPOLE PERFORMANCE

J. S. Cohen et al. [2012, J. Herpetology 46(1):85-90] note that terrestrial plant litter is an important subsidy to freshwater ecosystems, where it serves as a basal resource in benthic food webs. Litter quantity and decomposition rate strongly influence energy flow through these food webs. Litter quantity often increases following nonnative plant invasions, but the impact this additional litter has on aquatic consumers is largely unknown. The authors conducted an experiment in outdoor microcosms containing plant litter, microbes, algae, and tadpoles. Many tadpoles feed on biofilms (bacteria, fungi, and algae) that develop during decomposition; as such, they are ideal organisms to test bottom-up effects of litter subsidies. The authors used a related pair of native and nonnative wetland grasses to investigate whether litter quantity affects tadpole performance. Tadpole performance metrics (developmental stage, size, and survival) showed significant positive responses to increased litter quantity but were mostly unaffected by plant species. Therefore, litter quantity was the primary determinant of tadpole performance in the experimental community. The authors suggest that changes to litter quantity can have important impacts on larval amphibians.

SMALLEST KNOWN HERBIVOROUS REPTILE

M. S. Valdecantos et al. [2012, Copeia 2012(2):203-210] report that a small, cold-climate lizard from the Andes of Argentina, *Liolaemus poecilochromus*, is primarily herbivorous (>80% plants in diet). This is true even for juveniles, making them the smallest herbivorous reptiles known. The authors detected relatively few differences in diet between the sexes, despite male-biased sexual dimorphism in head and body size. Adults consumed more mites and flowers than juveniles, and a weak ontogenetic shift from omnivory to herbivory was detected that is attributable to the lower volumetric consumption of plants by juvenile males. The paper discusses the abiotic and biotic conditions that likely selected for herbivory in this and other small-bodied, high-elevation *Liolaemus*.

ESCAPE BEHAVIOR OF ANOLES

Z. M. Jones and B. C. Jayne [2012, J. Herpetology 46(1):5155] quantified the effects of auditory stimuli on locomotor performance during the escape responses of two species of arboreal lizard, *Anolis sagrei* and *Anolis carolinensis*, with two different groups per each species, that were either long-term captives or recently caught. Other than presence or absence of a loud sound, conventional methods were used for handling the lizards and eliciting an escape. For both species and times in captivity, the addition of a loud sound significantly increased the escape running speed, in part by decreasing the amount of pausing. Although the trends were similar for recently caught individuals and long-term captives, the magnitude of the effect of the loud sounds was less for the recently caught individuals. *Anolis sagrei* was faster than *A. carolinensis* regardless of the stimulus, and the rank order of individuals based on performance within each experimental group and species did not change significantly with different auditory stimuli. Results of this study suggest the auditory system may be important for detecting and evading threats despite the lack of vocalization in these lizards.

DESERT TORTOISES IN WIND FARMS

J. R. Ennen et al. [2012, Copeia 2012(2):222-228] investigated the annual nesting ecology of a population of desert tortoises (*Gopherus agassizii*) inhabiting a utility-scale renewable energy (USRE) facility in southern California and compared the results with populations inhabiting relatively undisturbed sites. In 2000, 15 radio-tracked females produced 29 clutches, and 24 nests were monitored to examine nest-site selection, nest predation, hatching success, date of emergence of hatchlings, and hatchling mass and carapace length. Overall, the nesting ecology of the population inhabiting the USRE facility was very similar to other populations of desert tortoises inhabiting relatively undisturbed habitats. Oviposition occurred from 12 May to 8 July, which was similar to other sites. Nest depths (11.1 cm), nest predation (12%), hatchling emergence date (7 August and 29 September), and hatchling morphometrics (i.e., midline carapace length: 44.5 mm; mass: 23 g) were all within ranges reported in other populations. Unlike within other populations, no relationship was seen between hatchling size and either maternal body size or egg width. No evidence was found of females selecting for a particular burrow for oviposition of eggs based on environmental or anthropogenic variables. Most nests were located in or near burrows, and nest depth was greater for nests near the entrance than those deeper in the burrow. Although this study suggests that the nesting ecology of the desert tortoise population studied was not adversely affected by the USRE facility, this relationship is only correlative because the study was not a before-after-control-impact (BACI) study, which would establish a cause and effect relationship. As pointed out in a recent review, BACI studies are critically needed to address the wildlife impacts of utility-scale renewable energy development.

USE OF UNDER-ROAD TUNNELS BY LONG-TOED SALAMANDERS

K. S. Pagnucco et al. [2012, Copeia 2012(2):331-340] note that Linnet Lake (Waterton Lakes National Park, Alberta, Canada) is the breeding site of a population of long-toed salamanders (*Ambystoma macrodactylum*) that has decreased dramatically over the last 15 years, partially due to vehicle-caused mortality occurring on an adjacent road. In May 2008, Parks Canada installed four amphibian tunnels under this road. Drift fences were installed to direct salamanders toward tunnel entrances and tunnel use was monitored with pitfall traps in 2008 and 2009. Salamander road mortality decreased from 10% of the population to <2% following installation of tunnels and fences. In 2009, 104 salamanders were documented using tunnels. Salamanders were 20 times more likely to use tunnels when traveling to the breeding site than when leaving the site. Distance from tunnel entrances, sex, and body size did not have significant effects on tunnel use by salamanders. Although salamander movement was positively correlated with occurrence of precipitation, this relationship was much stronger when salamanders were leaving the breeding site. Variation in use between the four tunnels was positively correlated with soil moisture of surrounding habitat. Continued monitoring will be needed to determine if tunnel use by long-toed salamanders increases through time, and if decreased road mortality translates into population gains.

ABNORMALITIES IN CANADIAN FROGS

C. D. Roberts and T. E. Dickinson [2012, Canadian Journal of Zoology 90(7):808-814] note that a parasitic flatworm (*Ribeiroia ondatrae*) is known to cause severe limb abnormalities and high mortality levels in American amphibian populations. The distributional pattern of this parasite—its main dispersal agent being birds—correlates with the boundaries of migratory flyways in the USA. Yet thus far, *R. ondatrae* have not been found in Canadian amphibians, which is surprising, considering that said flyways extend well into northern Canada. This study reports on a lake in British Columbia that is known to support amphibians with abnormalities similar to those induced by *R. ondatrae*. To determine if the parasite was present and if it was the cause of the abnormalities, the authors collected and necropsied metamorphs of the Columbia spotted frog (*Rana luteiventris*) and the Pacific chorus frog (*Pseudacris regilla*), and set up field enclosures to protect larvae from *R. ondatrae*. Abnormality levels were high in both species (>20%), with the vast majority being found in close proximity to the metacercariae of *R. ondatrae*. Moreover, the types of abnormalities closely matched those previously recorded in field and laboratory exposures of amphibians to *R. ondatrae*. Finally, larvae that developed in the same lake, but were protected from *R. ondatrae* by an enclosure, did not develop abnormalities. Collectively, these results demonstrate that *R. ondatrae* are both present in an amphibian community in Canada and responsible for causing limb abnormalities.

EFFECTS OF INTRODUCED MAMMALS ON A NATIVE GECKO

C. D. Knox et al. [2012, J. Herpetology 46(2):145-152] examined relationships between livestock grazing and the activity of introduced rodents and population density of jeweled geckos, *Naultinus gemmeus* (Diplodactylidae) on the Otago Peninsula, South Island, New Zealand. It was expected that livestock grazing would prevent the proliferation of rank grass (which is often associated with high rodent densities) and thereby reduce the frequency of predation by rodents on jeweled geckos. Thus, the authors predicted activity of rodents to be lower, and density of jeweled geckos higher, at sites grazed by livestock. This was tested for two habitats: *Coprosma* spp. shrubland and regenerating kanuka (*Kunzea ericoides*) forest. Density of jeweled geckos was quantified using visual searches, photography and mark-recapture. Tracking tunnel surveys were used to estimate the activity of introduced rodents. The activity of rodents (*Rattus* spp. and *Mus musculus*) was significantly higher at ungrazed compared to grazed sites in both habitats. Density of jeweled geckos in *Coprosma* was over four times higher at grazed sites and decreased with increasing rodent activity, however, in kanuka, density was significantly higher at the ungrazed sites. The authors infer that in ungrazed *Coprosma*, rank grasses support high rodent densities and, consequently, high predation of jeweled geckos. Thus, grazing by introduced livestock may promote the survival of jeweled geckos and the persistence of high density populations in *Coprosma* shrubland. In contrast, grazing in regenerating kanuka may impact on jeweled geckos negatively, possibly by removing thermal refugia.

ECOLOGY OF EASTERN FOXSNAKES

J. R. Row et al. [2012, J. Herpetology 46(1):94-99] note that determining how animals respond to habitat loss and fragmentation requires detailed studies of habitat use and behavior in regions that vary in their degree of fragmentation. As predators, snakes are an important component of ecosystems, yet little is known about how they respond behaviorally to habitat loss. Using radiotelemetry at two locations that differ in their habitat patch size, The authors examined habitat-use patterns at two spatial scales and movement patterns for the endangered eastern foxsnake (*Pantherophis gloydi*). Movement patterns were similar at the two locations, but individuals exhibited greater variation in home-range size, and males and gravid females dispersed further from hibernation sites within the larger natural habitat patch. Individuals from both locations preferred marsh at the home-range scale, but open dry habitat at the location scale. Within the smaller habitat patch, however, these preferences were accentuated with snakes avoiding agricultural fields. At the landscape scale, individual occurrence records were found closer to, and in areas with a higher density of, usable habitat than locations that are distributed randomly.

BULLSNAKE–FOXSNAKE HYBRIDS

J. B. LeClere et al. [2012, J. Herpetology 46(2):257-262] describe two intergeneric hybrid snakes (*Pituophis catenifer sayi* × *Pantherophis vulpinus*) from the Midwestern United States; one collected in south central Iowa and the other from southeastern Minnesota. Both specimens are morphologically intermediate between the putative parental species *P. c. sayi* and *P. vulpinus*. Hybrid origin was verified by comparing DNA sequence data from the hybrids to the putative parental species. Both hybrid specimens possessed *P. c. sayi* mitochondrial DNA haplotypes. Examination of the nuclear gene Vimentin (intron 5) showed both specimens were heterozygous at most variable sites confirming their hybrid origin. These snakes represent only the second and third confirmed instances of naturally occurring intergeneric hybridization among squamate reptile species.

REDISCOVERY OF A RARE SEA SNAKE

A. R. Rasmussen et al. [2012, Copeia 2012(2):276-282] report that Smith's small-headed sea snake, *Hydrophis parviceps*, was originally described in 1935 from a single type specimen collected in southern Vietnam. Since this time there has been only one further record for the species—a specimen collected near the type locality in 1960 that has since been lost. Through field surveys in southern Vietnam in 2001, the authors obtained three additional specimens of this poorly known sea snake from fisheries bycatch. This paper includes morphological and molecular data for the three new specimens and the holotype, and redescribes *H. parviceps* based on data synthesized for all five specimens known to date. The authors also discuss the conservation status of the species based on its vulnerability to fisheries bycatch mortality and seemingly low abundance within a very restricted geographic distribution.

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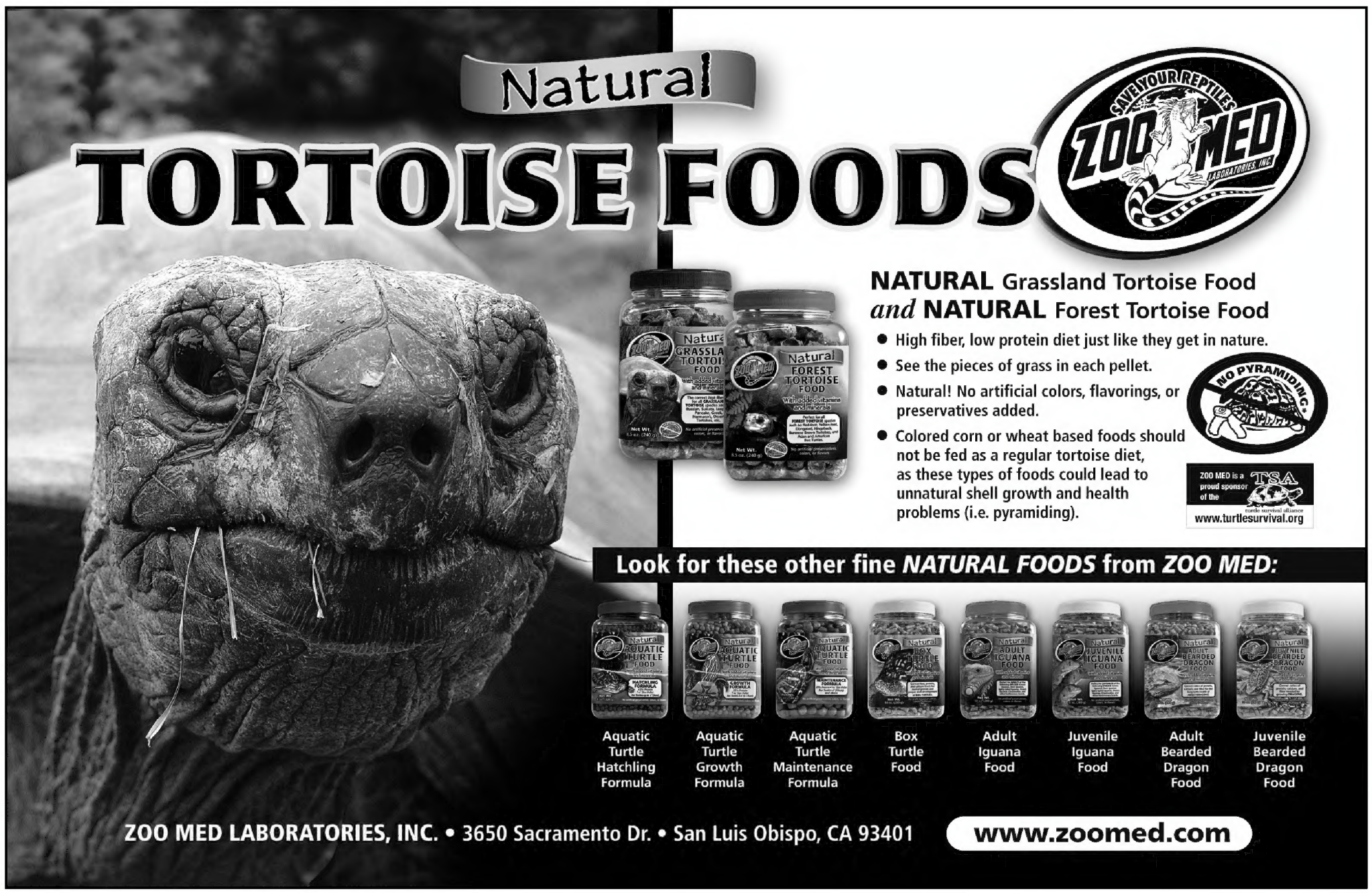
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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, June 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Bryan Suson**, a freelance ecologist from Libertyville, Illinois, will speak on "Ecuador: Biodiversity in the New World Tropics." Bryan was gracious enough to respond affirmatively to a last-minute invitation when our previously scheduled speaker canceled. He has spent many months in Ecuador and has many spectacular photographs to share with us.

At the August 29 meeting **Roger Repp** of Tucson, Arizona, will present "Burrow Buddies—or Not? (What's up with That?)." This program deals with desert herp species that den communally. Roger spent his formative years in the Chicago suburbs. He came out of his mother's womb a herpetologist, but the formation of the Chicago Herpetological Society was the catalyst for a lifelong passion for our crawly friends. By profession, he is Instrument Shop Supervisor for the National Optical Astronomy Observatory. By avocation, he is a rabid field herpetologist who has averaged 800 field hours per year in Arizona since 1989.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., August 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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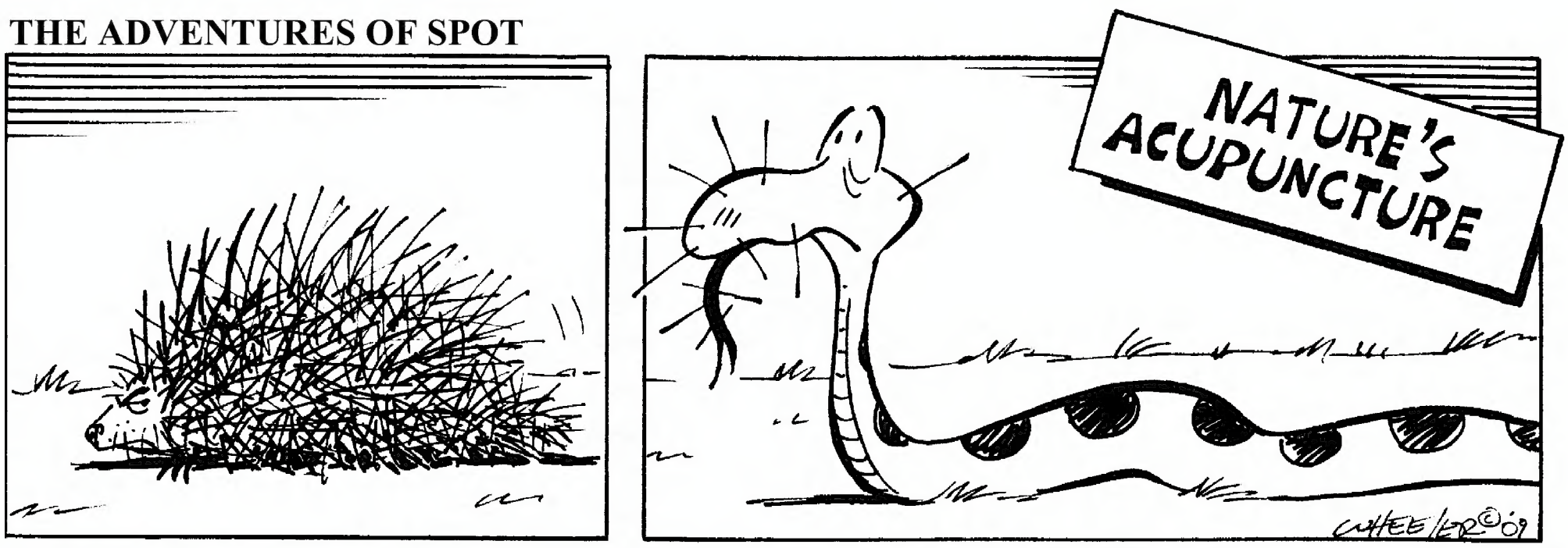

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